

greater.³³ DOCSIS 3.0 requires fiber in the second and middle mile, and thus the widespread deployment of these services is further confirmation that cable operators have been able to deploy or obtain fiber facilities to support their services.

For example, Cablevision has deployed DOCSIS 3.0 throughout its entire footprint, and has begun advertising 101 Mbps downstream service.³⁴ Comcast has already deployed DOCSIS 3.0 to 50 percent of its footprint and indicated that 80 percent of its footprint will be DOCSIS 3.0 capable by year-end 2009.³⁵ Cox plans to offer DOCSIS 3.0 speeds in more than two-thirds of its systems across the country by the end

³³ See Cablevision News Release, *Cablevision Breaks the Century Mark – Introduces Nation's First 101-Megabits-Per-Second High-Speed Internet Service, Optimum Online Ultra* (Apr. 28, 2009); Charter Communications New Release, *Charter Internet Customers To Enjoy Faster Downloads Through PowerBoost Technology and Double Upload Speeds* (Oct. 27, 2009) (Charter's High-Speed Internet Ultra60 offers customers speeds up to 60 Mbps downstream/5 Mbps upstream); Comcast Press Release, *Comcast Rolls Out Extreme 50 Mbps High-Speed Internet Service in Washington, D.C. and Metro Area* (June 9, 2009) (Comcast's Extreme 50 offers speeds up to 50 Mbps downstream/10 Mbps upstream); Time Warner Cable, *Wideband Internet*, <http://www.timewarnercable.com/nynj/learn/hso/wideband-internet/default.html> (Time Warner's Wideband Internet offers customers speeds up to 50 Mbps upstream/5 mbps downstream).

³⁴ See Cablevision News Release, *Cablevision Breaks the Century Mark – Introduces Nation's First 101-Megabits-Per-Second High-Speed Internet Service, Optimum Online Ultra* (Apr. 28, 2009); Craig Moffett et al., Bernstein Research, *U.S. Telecommunications, Cable & Satellite: The Dumb Pipe Paradox, Revisited*, at 19 (June 11, 2009).

³⁵ See *Q2 2009 Comcast Corporation Earnings Conference Call – Final*, FD (Fair Disclosure) Wire, Transcript 080609a2285950.750 (Aug. 6, 2009) (statement by Comcast EVP & CFO Michael Angelakis); Jessica Reif Cohen, Bank of America – Merrill Lynch, *Pay TV Conference Wrap*, at 2 (Sept. 11, 2009); *Comcast Corporation at Bank of America Securities Media, Communications & Entertainment Conference – Final*, FD (Fair Disclosure) Wire, Transcript 090909a2385577.777 (Sept. 9, 2009) (statement by Comcast COO Stephen Burke).

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of 2010.³⁶ Time Warner Cable recently deployed DOCSIS 3.0 in New York City, and states that it will continue to make DOCSIS 3.0 available in 2010.³⁷ Analysts estimate that, by 2013, DOCSIS 3.0 will be available to approximately 99 percent of U.S. homes passed by cable.³⁸

Smaller cable companies serving rural areas have likewise begun deploying DOCSIS 3.0. For example, Sjoborg Inc., which serves 33 towns and townships in northwest Minnesota, with populations as small as 89, plans to offer DOCSIS 3.0 upgrades by the first quarter of 2010.³⁹ Bend Broadband, which passes 62,000 homes and businesses in central Oregon, plans to implement DOCSIS 3.0 throughout its footprint in 2009.⁴⁰

DSL. Like cable operators, DSL providers often self-supply the network links that the Public Notice characterizes as the second mile, and in many cases also self-provision the middle-mile facilities in their networks. As discussed above, rural incumbent LECs have formed consortia to deploy middle-mile facilities, and these

³⁶ Traci Patterson, *Cox Ups Internet Speeds, Boards ESPN360.com Train* (Sept. 24, 2009), <http://www.cedmagazine.com/News-Cox-Internet-speeds-ESPN360-092409.aspx>.

³⁷ Time Warner Cable News Release, *Time Warner Cable Launches Its Fastest Internet Yet in New York City with Time Warner Cable Wideband Internet & Business Class Wideband Internet* (Sept. 24, 2009); *Time Warner Cable, Inc. at Goldman Sachs Communacopia Conference New York – Final*, FD (Fair Disclosure) Wire, Transcript 091509a2435064.764 (Sept. 15, 2009) (statement by Time Warner Cable CFO & Senior EVP Rob Marcus).

³⁸ Todd Spangler, *Report: DOCSIS 3.0 To Blanket U.S. by 2013*, Multichannel News (May 1, 2009), http://www.multichannel.com/article/231033-Report_DOCSIS_3_0_To_Blanket_U_S_By_2013.php (citing statistics from Pike & Fischer).

³⁹ See Letter from Steven Morris, NCTA, to Marlene Dortch, FCC, GN Docket No. 09-29 (Apr. 10, 2009).

⁴⁰ See *id.*

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consortia can recover the cost of such facilities over a larger base of customers and make them more economic. Some rural municipalities also have taken it upon themselves to invest in competitive facilities.

In most areas of the country, the cost and availability of middle- and second-mile facilities support deployment of high-speed DSL services. Today, DSL services are available to at least 83 percent of U.S. households nationwide,⁴¹ at advertised speeds ranging between 768 kbps and 7.1 Mbps downstream, and between 384 kbps and 896 kbps upstream.⁴² Verizon makes DSL available to approximately 25 million households in its footprint,⁴³ at advertised speeds ranging from 1 Mbps to 7.1 Mbps downstream and between 384 kbps and 768 kbps upstream.⁴⁴

DSL also is available in many rural areas, although this is due at least in part to the provision of high-cost support to rural telephone companies, which has subsidized this deployment by funding joint-use voice and data facilities. The Commission's latest

⁴¹ Ind. Anal. & Tech. Div., Wireline Competition Bureau, FCC, *High-Speed Services for Internet Access: Status as of June 30, 2008*, at Table 14 (July 2009).

⁴² See Verizon, *Verizon High Speed Internet: Plans*, <http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm> (offers downstream speeds ranging from up to 1 Mbps to 7.1 Mbps, with upstream speeds ranging from up to 384 kbps to 768 kbps); AT&T, *Compare DSL Plans – AT&T High Speed Internet Direct*, <http://www.att.com/gen/general?pid=11575> (offers downstream speeds ranging from up to 768 kbps to 6.0 Mbps, with upstream speeds ranging from up to 384 kbps to 768 kbps); Qwest, *Compare Qwest High-Speed Internet Plans*, http://www.qwest.com/residential/internet/broadbandlanding/compare_plans.html (offers downstream speeds ranging from up to 1.5 Mbps to 20.0 Mbps, all with upstream speeds of up to 896 kbps).

⁴³ See Verizon News Release, *Verizon's High Speed Internet Service Now Available in Simpsonville and Woodruff, S.C., Areas* (Sept. 2, 2009).

⁴⁴ Verizon, *Verizon High Speed Internet: Plans*, <http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm>.

data indicate that, as of 2008, approximately 91 percent of the smallest rural LECs had upgraded their plant to provide broadband.⁴⁵ NECA notes that, according to its most recent Trends report, “overall broadband availability to customers served by its Traffic Sensitive (“TS”) pool members reached 92 percent in 2008, a large increase from the 2005 average broadband availability of 79 percent.”⁴⁶ Small rural LECs have received approximately 86 percent of the funding provided through USF high-cost support mechanisms, as compared to 14 percent of such funding provided to Verizon, AT&T, and Qwest combined.⁴⁷

Fiber. Verizon and other companies also have deployed middle-mile and second-mile facilities to support the fiber-based broadband services that are now being deployed to millions of U.S. households. Although middle-mile facilities are one of the costs in a fiber-based broadband network, these costs generally do not drive the decision of whether fiber-based broadband is economic in a given location. The key cost factor is instead the cost of replacing last mile copper with fiber, which is why some companies have opted to deploy fiber to a neighborhood node (“FTTN”), rather than all the way to the customer’s

⁴⁵ *FCC September 2009 Broadband Study* at 47.

⁴⁶ Comments of the National Exchange Carrier Association at 2-3, *Report on Rural Broadband Strategy*, GN Docket No. 09-29 (FCC filed Mar. 25, 2009) (citing NECA, *Trends 2008*, at 3, 7 (2008) (“NECA, *Trends 2008*”).

⁴⁷ *FCC September 2009 Broadband Study* at 47. Approximately 97 percent of the TS pool members offer DSL, while only 38 percent were deploying fiber loops in their networks. NECA, *Trends 2008* at 7 & 18. As of 2008, TS pool members had deployed 1.3 million DSL lines and 372,000 fiber loops in their networks. NECA, *Trends 2008* at 6, 7, Table 2 (fiber loops include 152,000 FTTP/FTTH loops and 220,000 FTTC/FTTN loops).

premises or home (“FTTP” or “FTTH”).⁴⁸ In the case of Verizon, by year-end 2006, our actual cost per home passed with FiOS (which would include last-mile costs as well as costs for what the Public Notice defines as the second mile) was \$799, and Verizon is on track to reduce that to \$700 by 2010.⁴⁹ Verizon’s gross capital cost per home connected to FiOS was \$842 as of year-end 2006, and Verizon is on track to reduce that to \$650 by 2010.⁵⁰ Of course, these costs are average costs for the areas where Verizon is deploying FiOS and vary area by area depending on the particular circumstances – housing density, aerial versus buried plant, soil type, etc.

Despite the significant costs, Verizon and other companies are in the process of deploying fiber-based broadband services to millions of households, including middle-

⁴⁸ See, e.g., Christopher Larsen et al., Prudential Equity Group, *RBOC Fiber Deployment and Video Services Update*, at 7, 11 (Dec. 28, 2005) (“AT&T’s choice to go with FTTN versus FTTP was driven by speed, but cost and invasiveness (digging streets and backyards, etc.) also aided the decision. (The biggest cost differential is trenching.). . . Because AT&T is installing fiber lines only to the node and is not upgrading all subs afterward, its deployment costs are significantly lower than Verizon’s on a per subscriber basis.”); Andrew Haskins et al., HSBC Global Research, *Heart of Glass: Fibre-Optic Upgrades Prove Fickle Friends*, at 12 (July 6, 2006) (“[T]he comparatively higher cost of FTTP is driven mostly by the need to lay fibre all the way to the premises, rather than just half way (ie FTTN) or indeed not at all (ie ADSL2+)”); National Telecommunications Cooperative Association, *NTCA 2007 Broadband/Internet Availability Survey Report* (Sept. 2007), http://www.usdoj.gov/atr/public/workshops/telecom2007/submissions/228008.htm#N_9_ (“Deployment cost remains the most significant barrier to wide deployment of fiber, followed by regulatory uncertainty, long loops, obtaining cost-effective equipment and low customer demand.”); Congressional Research Service, *Broadband Internet Regulation and Access: Background and Issues*, at CRS-3 (Apr. 14, 2006), http://digital.library.unt.edu/govdocs/crs/data/2006/upl-meta-crs-8747/IB10045_2006Apr14.pdf (“[T]he high cost of installing optical fiber in or near users’ homes has been a major barrier to the deployment of FTTH”).

⁴⁹ Letter from David Young, Verizon, to Marlene Dortch, FCC, GN Docket No. 09-51, at 2 (Sept. 11, 2009).

⁵⁰ See *id.* at 3.

and second-mile facilities to support these services. These fiber-based deployments now pass over 15 million households nationwide;⁵¹ analysts expect that total (including both FTTP/FTTH and FTTN) to reach 50 million by 2012.⁵² Verizon accounts for a large share of these totals. Verizon is investing over \$23 billion to pass 18 million premises with its next-generation, all-fiber FiOS network by the end of next year, and has already passed approximately 13.8 million of those premises – approximately 43 percent of households in its current landline footprint.⁵³

Apart from Verizon, most FTTH deployment has occurred in rural areas, where it has been indirectly subsidized in many (if not most) cases by federal funding or has been deployed by municipalities or public utilities.⁵⁴ According to one study, there are “a total of 681 other providers of FTTH in America which represents over 1.1 million total

⁵¹ Letter from Thomas Cohen, Kelley Drye & Warren, LLP, Counsel for Fiber-to-the-Home Council, to Marlene Dortch, FCC, GN Docket No. 09-29, at 1 (Apr. 21, 2009). See also FTTH Council Press Release, *North American Fiber to the Home Connections Surge Past Five Million* (Sept. 29, 2009) (17.2 million homes passed in North America as of September 2009).

⁵² See Craig Moffett et al., BernsteinResearch, *U.S. Telecommunications, Cable & Satellite: The Dumb Pipe Paradox, Revisited*, at 4-5, Exhibit 2 (June 11, 2009).

⁵³ Verizon Communications, *Q2 Investor Quarterly 2009*, at 8 (July 27, 2009), <http://investor.verizon.com/financial/quarterly/vz/2Q2009/2Q09Bulletin.pdf?t=633918072029266115>.

⁵⁴ See, e.g., Michael Render, RVA LLC, *Overview: ILEC vs. Muni-Fiber Builds*, The FTTH Prism (Mar. 2009), <http://www.chaffeefiberoptics.com/nwsltr/ftthprismvol6no2.pdf>; Letter from Larry Sevier, CEO, Rural Telephone Service Company, Inc., to Marlene Dortch, FCC, GN Docket No. 09-29 (May 14, 2009) (Rural Telephone Service Co., which serves 13,800 customers in an area of “remote western Kansas” that “consists of approximately 6,600 square miles roughly the size of Connecticut and Rhode Island” states that it is “providing broadband service to approximately 95 percent of our service area through various technologies, mainly fiber-to-the-premise (FTTP),” and that it relies on “internal equity funds, the RUS loan program and USF in order to provide affordable infrastructure.”).

connections.”⁵⁵ One research analyst notes that “approximately one-half of rural ILECs have already started providing FTTH to some or all of their customers, and another quarter plan to start building FTTH in the next three years. Over 12 percent of rural ILEC customers have already been passed with fiber and over 7 percent have been connected.”⁵⁶ In other rural areas, however, “FTTH deployment has been slow.”⁵⁷

Some companies – most notably AT&T and Qwest – have decided to deploy FTTN rather than FTTP services.⁵⁸ AT&T states it has passed more than 19 million housing units with its U-Verse network, and has indicated that it plans to deploy the service to 30 million housing units by the end of 2011.⁵⁹ Qwest reports it has deployed FTTN service to more than two million homes, and expects to reach more than three million homes by the end of the year.⁶⁰

⁵⁵ RVA LLC, *Fiber-to-the-Home: North American Market Update, for the FTTH Council*, at 9-10 (Apr. 2009), http://www.ftthcouncil.org/sites/default/files/RVA.FTTH_.Apr09.060109.pdf.

⁵⁶ Michael Render, RVA LLC, *Overview: ILEC vs. Muni-Fiber Builds*, The FTTH Prism (Mar. 2009), <http://www.chaffeefiberoptics.com/nwsltr/ftthprismvol6no2.pdf>.

⁵⁷ *Id.*

⁵⁸ AT&T and Qwest claim to be able to offer broadband speeds of up to 18 Mbps and 40 Mbps downstream, respectively, over these networks. AT&T, *AT&T U-verse High Speed Internet*, <http://www.att.com/u-verse/explore/internet-landing.jsp>; Qwest Press Release, *Qwest Unveils 40 Mbps Downstream, 20 Mbps Upstream High-Speed Internet Service* (July 20, 2009).

⁵⁹ AT&T News Release, *AT&T U-verse TV Ranks Highest in J.D. Power and Associates Study in South and West Regions for Second Year in a Row* (Oct. 7, 2009); AT&T News Release, *AT&T Reports Fourth-Quarter and Full-Year Results Highlighted by Robust Wireless Data Growth, Accelerated U-verse TV Ramp, Continued Double-Digit Growth in Data Services* (Jan. 28, 2009).

⁶⁰ Qwest Press Release, *Qwest Unveils 40 Mbps Downstream, 20 Mbps Upstream High-Speed Internet Service* (July 20, 2009); Qwest, *Shareholders Meeting: Chairman's Remarks* (Ed Mueller), at 4 (2009).

C. Middle-Mile and Second-Mile Facilities for Wireless Broadband

As is the case with wireline broadband, extensive middle-mile and second-mile facilities have been deployed to support multiple wireless broadband alternatives in areas of the country where most Americans live. Consumer demand for wireless bandwidth is growing at an extraordinary pace, however, and going forward wireless carriers will need significant additional capacity to their cell sites in order to support greater use of 3G and 4G services.⁶¹ Many wireless carriers are accordingly in the process of upgrading the amount of bandwidth they obtain between their cell sites and mobile switching centers (so-called “wireless backhaul”), which has facilitated a widespread transition from copper to fiber and fixed-wireless technologies.⁶²

As Verizon has previously demonstrated, the marketplace for wireless backhaul is competitive and growing more so, particularly in urban and suburban areas where

⁶¹ See In-Stat Press Release, *Growth in Mobile Data Triples Backhaul Capacity Demands* (Oct. 10, 2009) (“[T]he need for more backhaul capacity will grow three-fold between 2009 and 2013”); FCC, National Broadband Plan Workshop, *Deployment – Wired*, Transcript at 31 (Aug. 12, 2009) (“*FCC Wired Deployment Transcript*”) (FiberNet President and COO David Armentrout: “[O]bviously more and more of the towers will require fiber backhaul”); *id.* at 45 (“T1s are out . . . it’s either going to be fiber or its going to be microwave.”); see also, e.g., Yankee Group, Anchor Report, *The Inevitable Transformation of the Mobile Internet* at 3 (Apr. 2009) (“Backhaul networks, which in most cases continue to be based on TDM and Frame Relay technologies cannot support the massive growth in broadband traffic demands.”); Visant Strategies Press Release, *Backhaul Capacity of United States Mobile Wireless Networks Will Continue To Increase Substantially, New Visant Strategies Report Finds* (Oct. 15, 2009), <http://finance.yahoo.com/news/Backhaul-Capacity-of-United-bw-2311028811.html?x=0&.v=1> (“base stations with more than 24 Mbps of backhaul capacity will grow by more than a factor of twenty from 2009 to 2015 . . . wireless backhaul links will nearly double by 2015.”).

⁶² See Jennifer Pigg, Yankee Group, *Mobile Backhaul: Will the Levees Hold?*, at 6 (June 2009) (“Mobile network operators in 2009 are relying predominantly on fiber, leased T1s and microwave for their backhaul solutions. . . . The industry is yielding to the pressures of increasing mobile traffic by gradually transitioning to fiber backhaul.”).

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demand for high-capacity services from cell sites is most concentrated. Intermodal competitors – particularly cable operators and fixed wireless providers – have rapidly emerged to fill the demand for higher-speed wireless backhaul services.⁶³ Each of the major cable operators – Comcast, Time Warner Cable, Cablevision, Cox, and Charter – has invested heavily to upgrade and extend their high-capacity networks to provide wireless backhaul services.⁶⁴ And there are now more than a dozen fixed wireless

⁶³ See, e.g., *FCC Wired Deployment Transcript* at 35 (Dallas Clement, Cox Communications EVP and Chief Strategy and Product Officer: “Relative to wireless backhaul from cell sites . . . I’ll tell you that in our commercial business it’s a growth area. We’re getting calls in our franchises from wireless providers who are preparing for their 4G networks and they’re looking for lower cost alternatives for back haul. And because we’re there and we can do sort of spurs off our network, we feel as though it’s a big growth area and we’re deploying capital to that area to be able to satisfy that demand.”); Ravi Potharlanka, COO, FiberTower Corp., Written Testimony before the House Energy and Commerce Committee, Subcommittee on Communications, Technology, and the Internet, Hearing on Competition in the Wireless Industry, at 3, 4 (May 7, 2009), http://energycommerce.house.gov/Press_111/20090507/testimony_potharlanka.pdf (FiberTower COO Ravi Potharlanka: “We offer our services to mobile wireless carriers, competitive and local exchange carriers, 1st responder networks, and to government and enterprise customers. Our network currently covers approximately 12,000 route miles with 7,000 miles covered using fixed wireless and another 5,000 miles using dark fiber. Through our partnership and master lease agreements we have the ability to access over 100,000 towers nationwide. . . . We have customer agreements with the eight largest U.S. wireless carriers.”).

⁶⁴ See Patrick Brogan & Evan Leo, *High-Capacity Services: Abundant, Affordable, and Evolving*, at 35-36 & Table 12 (July 2009) (“*USTelecom Report*”), attached to Letter from Glenn Reynolds, USTelecom, to Marlene Dortch, FCC, WC Docket No. 05-25, GN Docket No. 09-51 (July 16, 2009); *Q2 2009 Comcast Corporation Earnings Conference Call – Final*, FD (Fair Disclosure) Wire, Transcript 080609a2285950.750 (Aug. 6, 2009) (statement by Comcast Corp. COO Steve Burke: “[W]e are expanding our cell backhaul operations and now have agreements with wireless carriers contracted for over 2000 towers. Our goal is to keep this business growing rapidly and this is an area where we would like to invest as much capital that gets a good return as possible.”). See also Comcast Corp., *3Q 2009 Results*, at 11 (Nov. 4, 2009), <http://files.shareholder.com/downloads/CMCSA/753959014x0x329261/33e5a9c9-7680->

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providers also offering wireless backhaul services in markets throughout the country.⁶⁵

For example, FiberTower calls itself “the nation’s leading alternative carrier for middle mile and last mile backhaul” with a network that “spans more than 6,000 base stations in 13 U.S. markets,” and with “access to more than 100,000 towers nationwide.”⁶⁶ Fiber-based competitors such as Level 3 also offer wireless backhaul services. Level 3 states that its Wireless Tower Access Service provides “more efficient and cost-effective options for wireless backhaul in metropolitan and rural locations,” and is “[p]rimarily located in rural areas.”⁶⁷ Wireless carriers acknowledge that they are using all of these various competitive alternatives.⁶⁸ There also are new technologies that allow wireless

4025-a068-a46668578fa1/3Q09%20Slide%20Faces%20-%20Final.pdf (wireless backhaul is “~\$1Bn opportunity for Comcast”).

⁶⁵ See *USTelecom Report* at 35-38 & Tables 11, 13.

⁶⁶ Comments of FiberTower Corporation at 3, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed June 8, 2009).

⁶⁷ Level 3 Press Release, *Level 3 Launches Wireless Tower Access Service* (Oct. 22, 2009); see also Kevin Fitchard, *Verizon Lays Fiber to 1000 Cell Sites*, Telephony Online (Nov. 2, 2009), <http://telephonyonline.com/3g4g/news/verizon-fiber-cell-sites-1102/> (“Level 3 is targeting rural and small town cellular networks by tapping into its in-line optical amplifiers spaced every 60 miles or so along its fiber backbone routes.”).

⁶⁸ FCC, National Broadband Plan Workshop, *Wireless Broadband Deployment – General*, Transcript at 45-46 (Aug. 12, 2009) (“*FCC Wireless Broadband Deployment Transcript*”) (T-Mobile Senior VP, Engineering Operations Neville Ray: “And, you know, be that fixed Ethernet delivery in one form or another over fiber, over coax, whatever it might be, you know, we are seeing economic forces at work in major metro areas where that is starting to change. So if I look at our 3G footprint today, we are certainly moving to, you know, a fiber back haul solution environment which is significantly higher than 10 percent. And I think that competitive forces work in metro areas where there’s a lot of fiber, be that from the utility company, from the cable company, from the existing, you know, telco provider”); *id.* at 46 (T-Mobile Senior VP, Engineering Operations Neville Ray: “[A]s you move to suburban fringe and rural areas, those [fiber] opportunities are much tougher to find, but there are good microwave solutions, as Ed [Evans, Stelera Wireless] mentioned, and some carriers are totally deploying their back haul solutions on a microwave basis”); *FCC Wired Deployment*

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carriers to obtain backhaul more economically by aggregating traffic from multiple cell sites to single aggregation points.⁶⁹

Wireless carriers have also demonstrated the ability to self-provision backhaul, including with respect to new 4G services. Most notably, Sprint has stated that it is “proceeding aggressively with its deployment of 4G WiMax technology” through its “\$7.4 billion investment in Clearwire,” which “will use self-provisioned microwave backhaul to handle the high-bandwidth requirements associated with 4G applications to the maximum extent possible.”⁷⁰ Clearwire claims to have “one of the largest wireless backhaul networks in the world”⁷¹ and has told analysts that it is investing in microwave equipment so it can self-provision facilities to meet “roughly 80 percent of its [wireless]

Transcript at 30 (Allied Fiber CEO Hunter Newby: “[I]t’s the combination of fiber and microwave, which for backhaul from towers that don’t have much fiber can cover a much larger swath of the country along this way”); *FCC Wireless Broadband Deployment Transcript* at 47 (Verizon VP, Network and Technology Strategy Tom Sawanobori: “There are microwave solutions of significant bandwidth that will support LTE and other fourth generation technologies”).

⁶⁹ See, e.g., Alcatel-Lucent Press Release, *Alcatel-Lucent Solidifies Market and Technical Leadership in Mobile Backhaul* (Apr. 1, 2008) (The 9500 Microwave Packet Radio is a “cell site aggregation product [which] flexibly aggregates packet-based and Time Division Multiplexing (TDM) traffic to provide optimized bandwidth backhaul capabilities over a common transport layer”); Overture Networks Press Release, *Overture Networks Sets Capacity Standard with New Pseudowire Gateway* (Sept. 16, 2009) (“With its ability to aggregate traffic from hundreds of cell sites, the UTX8500 enables carriers to reduce costs by 50% or more when compared to previous technology alternatives.”).

⁷⁰ Comments of Sprint Nextel Corporation at 5, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, As Amended by the Broadband Data Improvement Act*, GN Docket No. 09-137 (FCC filed Sept. 4, 2009).

⁷¹ *Leap Wireless International at Jefferies Panel Discussion*, FD (Fair Disclosure) Wire, Transcript 090908ay.703 (Sept. 9, 2008) (statement by Clearwire Chief Strategy Officer Scott Richardson).

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backhaul . . . from microwave links.”⁷² Clearwire also stated that it “will make its metro wireless backhaul networks available to Sprint at preferred rates, creating additional revenue opportunities for Clearwire and reducing costs for Sprint.”⁷³ Clearwire is backed by a total of over \$3 billion from Comcast, Time Warner Cable, Bright House Networks, Intel, and Google,⁷⁴ and will therefore have the ability to obtain wireless backhaul from these cable partners.

T-Mobile also has acknowledged that the company has various competitive options for wireless backhaul, including self-provisioning. The company’s CTO has stated that T-Mobile is obtaining fiber from “alternate access companies,” and “more promising[ly] . . . the cable industry” and also is considering “a more organic opportunity . . . to simply build high-capacity microwave.”⁷⁵ T-Mobile has entered into backhaul agreements with Bright House Networks, FPL FiberNet, IP Networks, and Zayo

⁷² John Hodulik, UBS Investment Research, *Clearwire Corp.*, at 13 (Dec. 19, 2008).

⁷³ *Sprint Nextel/Clearwire WiMax Call – Final*, FD (Fair Disclosure) Wire, Transcript 050708a1844939.739 (May 7, 2008) (statement by Clearwire Chief Executive Ben Wolff).

⁷⁴ See Clearwire Corp. News Release, *Clearwire Completes Transaction with Sprint Nextel and \$3.2 Billion Investment To Launch 4G Mobile Internet Company* (Dec. 1, 2008); Benjamin Swinburne et al., Morgan Stanley, *Downgrade: This Defense Not the Best Offense*, at 18 (Jan. 23, 2009) (“Comcast, Time Warner Cable, and Bright House Networks have invested \$1.7B in total for roughly 12% economic ownership of Clearwire”).

⁷⁵ Om Malik, *The GigaOM Interview: Cole Brodman, CTO, T-Mobile USA*, GigaOM (May 12, 2009), <http://gigaom.com/2009/05/12/the-gigaom-interview-cole-brodman-cto-t-mobile-usa>.

Bandwidth,⁷⁶ and also is reported to have agreements with Comcast and Sprint for 4G backhaul.⁷⁷

The extensive deployment of wireless broadband services and the continued massive investment in these services including 4G technology, confirms that the cost and availability of middle-mile and second-mile facilities are not issues in most areas of the country. At least 90 percent of Americans now have access to 3G mobile broadband services at their primary place of residence,⁷⁸ and nearly three-quarters of consumers have a choice of multiple 3G mobile broadband carriers.⁷⁹ In 2008 and 2009 alone, wireless carriers have invested more than \$40 billion to further upgrade their networks.⁸⁰

⁷⁶ T-Mobile Press Release, *T-Mobile Signs New Backhaul Agreements for Six Major U.S. Markets* (Sept. 18, 2008).

⁷⁷ See Rob Jackson, *T-Mobile 4G Network Coming with Help from Comcast*, Phandroid (June 5, 2009), <http://phandroid.com/2009/06/05/t-mobile-4g-network-coming-with-help-from-comcast/>.

⁷⁸ CostQuest Associates, Inc., *US Ubiquitous Mobility Study*, at 4 (Apr. 17, 2008) (submitted to CTIA).

⁷⁹ *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services*, Thirteenth Report, 24 FCC Rcd 6185, ¶ 144, Table 9 & ¶ 146, Table 10 (2009) (“*Thirteenth CMRS Report*”).

⁸⁰ See Comments of CTIA – The Wireless Association at 12-13, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed Aug. 31, 2009) (U.S. wireless carriers spent \$20.17 billion in capital expenditures in 2008; this investment yields “a total cumulative capital expenditure in operational systems of more than \$90 billion over the last four years (not including the billions of dollars paid to the federal treasury for spectrum, or investment in pre-operational systems)”; Phil Cusick et al., Macquarie Research, *Follow the Money: 2Q Telco and Cable Capex Preview*, at 1 (July 23, 2009) (“We believe the major carriers will maintain or increase their capex budgets for 2009.”); Timothy Horan et al., Oppenheimer, *Reviewing Industry Capex/FCF*, at 4, Exhibit 2 (Oct. 21, 2009) (estimating wireless capital expenditures of \$22.3 billion in 2009, up from \$20 billion in 2008).

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In addition to Verizon and AT&T, other national, regional, and smaller wireless carriers have extensively deployed 3G services and are beginning to deploy next-generation 4G services. For example, Sprint's 3G network reaches over 270 million people,⁸¹ and Sprint is now also in the process of an "aggressive expansion of Sprint 4G," using WiMAX technology.⁸² Sprint has invested more than \$7 billion in Clearwire to deploy this new 4G WiMAX network, which Sprint claims will be made available "to as many as 120 million people."⁸³ As noted above, Comcast, Time Warner Cable, Bright House Networks, Intel, and Google also are major investors in Clearwire, and these cable partners plan to sell Clearwire's service.⁸⁴ T-Mobile has stated that it "has invested over \$7 billion thus far" to build out its 3G network, that in 2009 it "plans to double the population currently covered by its high-speed network to reach more than 200 million people in the U.S.," and that it is "also planning next-generation mobile broadband services and is actively considering advanced technologies such as 'HSPA Plus'

⁸¹ Sprint, *Welcome to Sprint Wireless Advantage Club*, http://www.sprint.com/landings/advantage_club/?id8=vanity:advantageclub.

⁸² See Sprint News Release, *Sprint Continues 4G Leadership with Launch in Raleigh, Durham, Chapel Hill and Cary, N.C.* (Nov. 2, 2009).

⁸³ Comments of Sprint Nextel Corp. at 5, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed Sept. 4, 2009); Comments of Sprint Nextel Corp. at 8, *Implementation of Section 6002 of the Omnibus Budget Reconciliation Act of 1993*, WT Docket No. 09-66 (FCC filed Sept. 30, 2009).

⁸⁴ See Frank Louthan et al., Raymond James, *Examining the Convergence of the Telecom and Cable Sectors*, at 23 (Aug. 18, 2008) ("As part of the agreement, the cable operators will sell branded wireless services under an MVNO (mobile virtual network operator) model using the Clearwire network for data). Comcast began providing 4G service in June 2009, and Time Warner Cable plans to launch 4G service on December 1, 2009. Comcast Press Release, *Comcast Begins National Rollout of High-Speed Wireless Data Service* (June 29, 2009); Time Warner Cable Press Release, *Time Warner Cable Brings 4G Wireless to North Carolina with Fastest Wireless Speeds Available* (Oct. 14, 2009).

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(‘HSPA+’) and Long Term Evolution (‘LTE’).⁸⁵ Smaller wireless carriers such as U.S. Cellular, MetroPCS, Leap, Cox, and Cellular South also have deployed 3G technology, and many such as MetroPCS, Leap, U.S. Cellular, and Cox have announced plans to deploy 4G technology.⁸⁶

Satellite broadband services also are widely available, from at least two providers, Hughes and Wild Blue (which ViaSat recently agreed to purchase for more than \$565 million).⁸⁷ These satellite providers advertise “true broadband speeds” of up to 5 Mbps

⁸⁵ Comments of T-Mobile USA, Inc. at 2, 3, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed June 8, 2009).

⁸⁶ See MetroPCS Press Release, *Unlimited Wireless Carrier MetroPCS Announces Vendors for 2010 4G LTE Launch* (Sept. 15, 2009) (MetroPCS plans to deploy LTE technology in the second half of 2010); David Barden et al., Bank of America/Merrill Lynch, *2Q09 Wrap: Taking Optimism Out of the Model; PO to \$28*, at 6 (Aug. 7, 2009) (Leap expects to undertake LTE trials in late 2009 and 2010); U.S. Cellular & TDS Telecom, *Presentation at the Kaufman Bros. 12th Annual Investor Conference*, at 18 (Sept. 10, 2009), <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTUyNjh8Q2hpbGRJRDR0tMXxUeXBIPtM=&t=1> (U.S. Cellular expects to conduct field trials of LTE technology in 2009 and 2010); Cox Press Release, *Cox To Launch Next Generation Bundle with Wireless in 2009* (Oct. 27, 2008) (Cox plans to test LTE technology).

⁸⁷ Other providers of satellite broadband service include: VSAT Systems, Spacenet, Skycasters, and Ground Control. See, e.g., VSAT Systems, *About VSAT Systems*, <http://www.vsat-systems.com/high-speed-internet/index.html> (“VSAT Systems offers industrial-strength, high-speed Internet access for businesses large and small”); Spacenet, *Brochure*, <http://www.spacenet.com/pdfs/about.pdf> (“Spacenet Inc. is a leading provider of high-performance satellite and hybrid terrestrial broadband services for enterprise, small business and government clients.”); Skycasters, *The Company*, <http://www.skycasters.com/the-company.html> (“Skycasters is a profitable, debt-free, privately held company that focuses on providing reliable and affordable full-time and backup broadband satellite solutions to businesses nationwide”); Ground Control Press Release, *Ground Control Systems, Inc., Awarded Oregon Satellite Contract* (Oct. 26, 2009) (“Ground Control Systems, Inc., a leading satellite internet and phone provider, has been awarded a contract from the State of Oregon to provide Satellite Services. Under the new contract, agencies will be able to access Broadband Internet where no current infrastructure is in place. . . . In the event land lines fail, the Ground Control network can serve as a primary data and voice link.”).

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downstream and 300 Kbps-1Mbps upstream, for their premium offerings.⁸⁸ They further recognize that “terrestrial broadband availability follows population density,” whereas the economics of satellite delivery are “not impacted by population density.”⁸⁹ For this reason, satellite broadband is an alternative even where other forms of broadband are not. According to Hughes, there are “[a]pproximately one million US customers being served by Hughes and WildBlue.”⁹⁰ The capability of satellite broadband is expanding; whereas current generation satellites support 10 Gbps total bandwidth, next generation satellites such as Hughes’ Jupiter and ViaSat-1 will support 100+ Gbps.⁹¹

IV. RESPONSES TO SPECIFIC QUESTIONS

As requested in the Public Notice, Verizon provides the following responses to the Commission’s questions concerning the cost and availability of middle- and second-mile facilities to support broadband services.

A. Question 1: Network Components of Broadband Connectivity

The Public Notice asks how much middle- and second-mile capacity is needed to provide adequate broadband Internet access. Because not all broadband subscribers use their connections at the same time, network operators typically use traffic engineering

⁸⁸ WildBlue/Hughes, *Satellite Broadband and the ARRA* at 3 (Mar. 23, 2009), *attached to* Letter from Stephen Baruch, Lerman Senter, Counsel for Hughes Network Systems, LLC, to Marlene Dortch, FCC, GN Docket No. 09-29 (Mar. 24, 2009).

⁸⁹ *Id.* at 4.

⁹⁰ Dean Mason, Senior VP & General Counsel, Hughes, *Satellite Broadband: Presentation to the Federal Communications Bar Association*, at 2 (Oct. 16, 2009) (“*Hughes FCBA Presentation*”). *See also* Comments of NRTC, *Rural Broadband Strategy*, GN Docket No. 09-29 (FCC filed Mar. 25, 2009) (WildBlue serves over 340,000 homes and businesses, including 82,000 served by NRTC members).

⁹¹ *Hughes FCBA Presentation* at 5.

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principles to determine peak loads of traffic for a given location, and engineer their networks to handle these peak loads. This ratio of last-mile-to-middle-or-second-mile capacity varies based on several factors, including the expected amount of peak loads in the last mile (which itself is constantly shifting), the type of traffic (*e.g.*, voice, video, or other types of data, which also is in constant flux) that must be supported, the level of end-to-end service quality that the network operator seeks to maintain, and the number of subscribers at a given location (with greater numbers, as a matter of statistical probability, generally giving network operators greater flexibility to adopt lower ratios).

While capacity requirements depend on several factors, the amount needed to support DSL in a rural central office can be approximated using the rate development assumptions for NECA's DSL tariff. In the cost support for its DSL tariff, NECA assumes that a rural LEC offering a 6 Mb/s DSL service requires 1 Mb/s of transmission capacity for every 10 DSL subscribers.⁹² Using that assumption, a 44.736 Mb/s DS3 middle-mile circuit would have enough capacity to support approximately 450 DSL subscribers.

For wireless services, most of the connections between cell sites and mobile switching centers (which the Public Notice classifies as "second mile") have used TDM-based DS1 circuits. The amount of capacity that Verizon has traditionally deployed between cell sites and mobile switching centers varies widely depending on the location -- in densely populated areas cell sites may contain as many as 12 DS1 circuits or more,

⁹² NECA, Access Service Tariff FCC No. 5, Transmittal No. 1245, at Volume 5, Exhibit 8, Workpaper 1 of 10, Line 14 (FCC filed June 16, 2009).

while in more rural and sparsely populated the areas there may be as few as two DS1 circuits per cell site.

As Verizon Wireless and other wireless carriers deploy 4G services, existing TDM-based connections between cell sites and mobile switching centers will be insufficient to handle the rapidly rising demand for broadband wireless services. To meet this demand, Verizon Wireless and other wireless carriers have begun replacing TDM-based DS1 circuits with fiber-based Ethernet service. In initial 4G deployments, for example, a cell site may require 50 to 100 Mbps Ethernet service. In many areas of the country, multiple providers are extending fiber to cell sites in order to provide Ethernet-based second-mile connections for 4G wireless services. In some rural and low-density areas, however, the need to extend fiber to more remote cell sites imposes costs that may hinder wireless broadband deployment.

From Verizon Wireless's perspective, fiber is the preferred technology for what the Public Notice describes as second-mile (and middle-mile) facilities to support the 4G services it is deploying. Microwave is a viable second-mile alternative in most locations (as the Clearwire experience also demonstrates). As discussed further below, Verizon Wireless uses its own microwave facilities to self-provision wireless backhaul in some cases. Nonetheless, Verizon Wireless is concerned that there will not be sufficient microwave spectrum to support the needs of its 4G wireless services going forward. Free Space Optics are emerging as a viable option for second-mile transmission, although this

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technology is limited to short distances and also may be susceptible to weather-induced fading.⁹³

B. Question 2: Availability and Pricing of Middle- and Second-Mile Connectivity

As demonstrated in Section III.A above, there are a wide variety of middle-mile and second-mile providers. Many broadband providers – including incumbent LECs, cable companies, and wireless carriers – are self-providing all or part of their second-mile and middle-mile requirements using their own fiber networks or fixed microwave or other wireless technologies. Alternatively, broadband providers may obtain fiber facilities or transmission services from a large number of providers, including cable companies, fixed wireless providers, competitive LECs, utility companies, regional fiber providers, national long-haul network operators, and incumbent LECs. These various providers offer middle-mile and second-mile facilities and transmission services under a wide variety of names, and under a wide variety of pricing structures, making it difficult to draw any generalizations about their offerings, other than to say there is extensive competition for these services in most areas of the country.

⁹³ See, e.g., Jennifer Ricklin et al., *Atmospheric Channel Effects on Free-Space Laser Communication*, 3 J. Optical Fiber Communications Reports 111 (2006) (“Free-space laser communication offers an attractive alternative for transferring high-bandwidth data However, there are a variety of deleterious features of the atmospheric channel that may lead to serious signal fading, and even the complete loss of signal altogether.”); Zeinab Hajjarian et al., *Analysis of Wireless Optical Communications Feasibility in Presence of Clouds Using Markov Chains*, 27 IEEE J. on Selected Areas in Communications 1 (Dec. 2009) (“In ideal free-space, the total loss due to absorption and scattering is virtually zero. . . . However, atmospheric obscurants such as; fog, haze, smoke, dust and clouds turn the propagation environment into a multiple scattering medium and hence introduce laser pulse broadening in space and time.”).

Verizon Wireless's Experience as a Purchaser of Wireless Backhaul. Verizon Wireless has significant experience purchasing wireless backhaul outside of Verizon's wireline footprint to support its extensive 3G network and the 4G LTE services it is deploying. In addition, Verizon Wireless has self-provisioned some of its backhaul needs using microwave.

Going forward, Verizon Wireless will need to replace its copper cell site connections with fiber or microwave and is concerned about the availability of such facilities in some rural areas to meet its needs. At the same time, it is Verizon Wireless's experience that in the past few years the competitive options for wireless backhaul facilities in most areas have increased considerably. For example, in connection with Verizon Wireless's deployment of LTE services it has solicited bids for areas where existing facilities need to be replaced or upgraded. As part of this LTE deployment Verizon Wireless has thus far received 12 bids from cable companies, four bids from fixed wireless providers, more than 35 bids from other competitive providers, and 20 bids from ILECs. As explained further above, the increase in competitive alternatives has occurred in large part because of the rapid growth in demand for wireless services generally, and in particular for wireless broadband services, which have increased the bandwidth requirements for wireless backhaul at individual cell sites.

Verizon's Rates for High-Capacity Services. On the wireline side, Verizon provides high-capacity services to a wide variety of wholesale and retail customers, including other broadband providers and wireless carriers. As Verizon has previously explained, the vast majority of Verizon's revenue from carrier customers for DS1 and

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DS3 services comes from purchases through discount plans and contract tariffs.⁹⁴ The remainder comes from purchases at standard tariff rate.

Attachment 1 contains Verizon's average revenue per unit for the DS1 and DS3 high-capacity services that Verizon sells through discount plans, contract tariffs, and standard tariffs.⁹⁵ Verizon separately tracks revenues for channel terminations and transport mileage. Revenues for transport and channel terminations are aggregated separately for urban, suburban, and rural areas.⁹⁶

Based on the actual rates that Verizon's customers pay for transport on a per-mile basis and the rates they pay for channel terminations, for most Verizon jurisdictions rates for high-capacity services are not materially higher in rural areas than the rates in urban and suburban areas. *See* Attachment 1. This suggests that the relative price of high-capacity facilities is not what makes the cost of such facilities uneconomic in rural and other underserved areas. Rather, it is the distance such facilities must be deployed and the relatively small base of customers from which the costs of those facilities can be recovered.

⁹⁴ See Supplemental Declaration of Quintin Lew ¶ 23, *attached to* Comments of Verizon, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 & RM-10593 (FCC filed Aug. 8, 2007).

⁹⁵ An ARPU-based analysis best captures what customers actually pay for services, as it reflects the discounted rates that customers actually pay. Tariff rates, on the other hand, vary significantly by term, volume, and other provisions. Tariff rates also do not easily capture discounts associated with pricing flexibility contracts.

⁹⁶ These data are for the year-to-date, as of July 2009. For purposes of classifying areas as urban, rural, and suburban, Verizon uses the following network engineering criteria: rural areas are those with fewer than 275 access lines per square mile; suburban areas are those with more than 275 and fewer than 4,800 access lines per square mile; and urban areas are those with 4,800 or more access lines per square mile.

Verizon's Tariff Discounts. The average revenues provided in Attachment 1 and discussed below reflect the discounts from standard tariffed rates that Verizon provides with respect to the vast majority of its high-capacity services. Verizon has introduced discount pricing plans (with price breaks of up to 65 percent off standard rates) and individually negotiated contract tariffs (with additional discounts up to 30 percent). Among other things, Verizon has introduced specific discount plans in response to wireless carriers' increasing demands for fiber facilities to their cell sites; Verizon's FiberConnect service offers wireless carriers discounted rates of as much as 45 percent on recurring charges. Verizon's discount programs are described in more detail in Verizon's filings in the Special Access proceeding, WC Docket No. 05-25 & RM-10593.⁹⁷

C. Question 3: Availability and Pricing of Internet Connectivity

As discussed in Section III.A above, a broadband provider serving a city that has an Internet Gateway may require only a few miles of transport from its central office, cable headend, or Mobile Switching Center to the IP Gateway. The broadband provider could self-provide that link, or it could obtain transmission services from a cable company, fixed wireless provider, competitive LEC, utility company, or the incumbent

⁹⁷ See, e.g., Letter from Donna Epps, Verizon, to Marlene Dortch, FCC, WC Docket No. 05-25, Attachment at 3-7 (Oct. 27, 2009); Reply Comments of Verizon at 11-19, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed Aug. 15, 2007); Comments of Verizon at 7-10, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed Aug. 8, 2007); Reply Comments of Verizon at 5-7, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed July 29, 2005); Comments of Verizon at 12-17, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed June 13, 2005).

LEC. Where a broadband provider is serving a city that does not have an Internet Gateway but instead is served by a long-haul network operator that has located a point-of-presence in the city, there are multiple national long-haul network operators that provide connectivity to long-haul POPs in virtually all cities and larger towns throughout the nation. Those providers include Verizon, AT&T, Sprint, Qwest, Global Crossing, Level 3, and XO.

Verizon's dedicated Internet access service – known as Internet Dedicated Service (“IDS”) – can have two components: (1) an Internet “port”; and (2) transport from the customer's location to a Verizon Internet Gateway. Verizon-provided transport is not required if the customer has collocated facilities in the same carrier hotel as a Verizon Internet Gateway. Verizon refers to this service arrangement as a “port only” service.⁹⁸

If the customer requires Verizon-provisioned transport from its location to Verizon's Internet Gateway, Verizon provisions that transport over a combination of its own facilities and transport services obtained from other providers. Because most IDS customers are concentrated in the cities in which Verizon has an Internet Gateway, the transport circuit is typically a short “metro” transport circuit. If a customer is located in a city that does not have a Verizon Internet Gateway, then the transport circuit also includes long-haul transport from the Verizon long-haul network point of presence (“POP”) in the customer's city to a Verizon Internet Gateway city. As shown in Attachment 2, Verizon has long-haul POPs in many urban areas. For its IDS service,

⁹⁸ See Verizon Business, *Internet Dedicated Services*, http://www.verizonbusiness.com/external/service_guide/reg/cp_internet_dedicated_services.htm.

Verizon refers to the link from the customer's location to the Verizon Internet Gateway or long-haul POP as "Network Access" or "Local Access."

Verizon's IDS offerings permit customers to select from an array of "port speeds," ranging from 128 kbps to 10 Gbps (OC-192). There is a specific price for each port speed. On a per-megabit basis, prices are lower for higher-bandwidth ports. In addition to the port bandwidth, the price of IDS depends on the contract term as well as other service features. Verizon's online service guide provides an overview of service options and general pricing information for each port speed.⁹⁹

The Public Notice (Q.3b) asks whether the price for connecting to an Internet backbone vary from location to location. Verizon's Internet port prices are independent of customer location. Customer location does, however, affect the price of the "Network Access" component of Verizon's IDS service, *i.e.*, the transport circuit from the customer's location to a Verizon Internet Gateway or long-haul POP. Because the cost of providing that transport circuit depends in large part on the length of the circuit, the cost of the Network Access component is generally higher to serve customers in rural areas than to serve customers in urban areas.

D. Question 4: Economics of Deployment

As discussed extensively in Part III above, the economics of broadband and associated deployment of middle- and second-mile facilities support multiple competitive providers of both wireline and wireless broadband in areas of the country where most Americans live. There are, however, rural and sparsely populated pockets of the country

⁹⁹ *See id.*

in which the economics of deploying broadband and middle- and second-mile facilities remain unfavorable given the high distance-driven costs of serving those areas coupled with the relatively small number of potential customers from which those costs can be recovered.

The Public Notice (Q. 4a) first asks whether the provision of middle- or second-mile connections “to a particular location is a natural monopoly in some locations.” Whether or not this is the case, however, is academic to the fundamental policy issues at hand. The core issue here is not about how many competitors there should ideally be in a given location, but that some locations have been unable to attract even a single entrant. Thus, the Commission should focus here on identifying the areas in which sufficient broadband and middle- and second-mile facilities do not yet exist, so that it can help foster deployment in those areas as set forth in Verizon’s proposal above by subsidizing deployment of middle-mile facilities.

The Public Notice (Q. 4b) next asks about the extent to which broadband providers “self-provide or integrate components of middle mile and/or second mile transport.” As discussed above, Verizon has self-provided all or virtually all of the middle-mile and/or second-mile facilities in its wireline broadband networks. Verizon Wireless also has self-provisioned wireless backhaul from its cell sites to its Mobile Switching Centers (or hub locations) in some cases.¹⁰⁰ When Verizon Wireless self-provisions wireless backhaul it is normally accomplished using microwave. Verizon Wireless will often self-provision backhaul to remote cell sites that are not served by any

¹⁰⁰ Verizon Wireless also obtains a significant amount of its backhaul from Verizon’s wireline operations.